

## Claims

1. A fly-back type synchronous rectifying switching power supply device in which a primary winding of a transformer and a main switch element are connected to each other in series between input terminals and which has a control circuit for subjecting the main switch element to PWM control within a fixed period, a synchronous rectifying element connected to a secondary winding of the transformer in series between output terminals, and driving means for turning on the synchronous rectifying element complementarily with the switching element, characterized by further comprising a different power supply source charged by a pulse voltage occurring at the secondary side winding of the transformer through a switching operation of the main switch element, and interrupting means which is disposed between the gate and source of the synchronous rectifying element and turns off the synchronous rectifying element, wherein an off-timing at which the interrupting means turns off the synchronous rectifying element is set to a timing which corresponds to a fixed time set by current from the different power source after the switch element is turned on and is within a range which is as near as a fixed driving period of the switch element.

2. The synchronous rectifying switching power supply device according to claim 1, wherein the interrupting means comprises a transistor and a timing capacitor connected to a

signal input terminal of the transistor, the timing capacitor is charged by the different power source and discharged at the instantaneous time when the main transistor is turned on, the timing capacitor is started to be charged from the instantaneous time concerned, and a period from this time to a time in which the voltage of the timing capacitor exceeds a threshold value of the signal input terminal of the transistor is set to a time within the fixed driving period of the switch element.

3. The synchronous rectifying switching power supply device according to claim 2, wherein the different power source is a constant voltage source or constant current source connected to the secondary side of the transformer.

4. The synchronous rectifying switching power supply device according to claim 3, wherein a snubber circuit for absorbing surge energy when the synchronous rectifying element is turned off is provided to the different power source for charging the timing capacitor so that the timing capacitor is charged with the energy absorbed by the snubber circuit.

5. A fly-back type synchronous rectifying switching power supply device in which a primary winding of a transformer and a main switch element are connected to each other in series between input terminals and which has a control circuit for subjecting the main switch element to PWM control within a fixed period, a synchronous rectifying element connected to a secondary winding of the transformer in series between output

terminals, and driving means for turning on the synchronous rectifying element complementarily with the switching element, characterized by further comprising a different power supply source charged by a pulse voltage occurring at the secondary side winding of the transformer through a switching operation of the main switch element, interrupting means which is disposed between the gate and source of the synchronous rectifying element and turns off the synchronous rectifying element, and a control element for comparing the output voltage of the different power source with the output voltage of the output terminal of the switching power supply device, and controlling the interrupting means to turn off the synchronous rectifying element when the output voltage of the different power source is reduced to a fixed value or less.

6. The synchronous rectifying switching power supply device according to claim 5, wherein a transistor of the interrupting means is an npn transistor for turning off the synchronous rectifying element, and the control element comprises a pnp transistor whose emitter and collector are connected to the output terminal and the base of the npn transistor respectively, and the output of the different power source is connected to the base of the pnp transistor.

7. The synchronous rectifying switching power supply device according to claim 6, wherein the different power source is a constant voltage source connected to the secondary side

of the transformer, and an output voltage of the different power source is divided to input the divided voltage to the base of the pnp transistor.

8. The synchronous rectifying switching power supply device according to claim 7, wherein a snubber circuit for absorbing surge energy when the synchronous rectifying element is turned off is provided to the different power source for charging the timing capacitor, and the timing capacitor is charged with the energy absorbed by the snubber circuit.